

STUDIES ON STONEFLIES OF NORTH DAKOTA WITH THE
DESCRIPTION OF A NEW *PERLESTA* SPECIES (PLECOPTERA: PERLIDAE)

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Abstract.—Records for fifteen stonefly taxa, including eleven confirmed species are given for North Dakota. Literature records for an additional three species could not be confirmed. *Perlesta dakota*, n. sp., is described from the adult male, female and egg. Diagnostic characters are presented using illustrations and a SEM photomicrograph.

Key Words: stoneflies, Plecoptera, North Dakota, *Perlesta*, new species

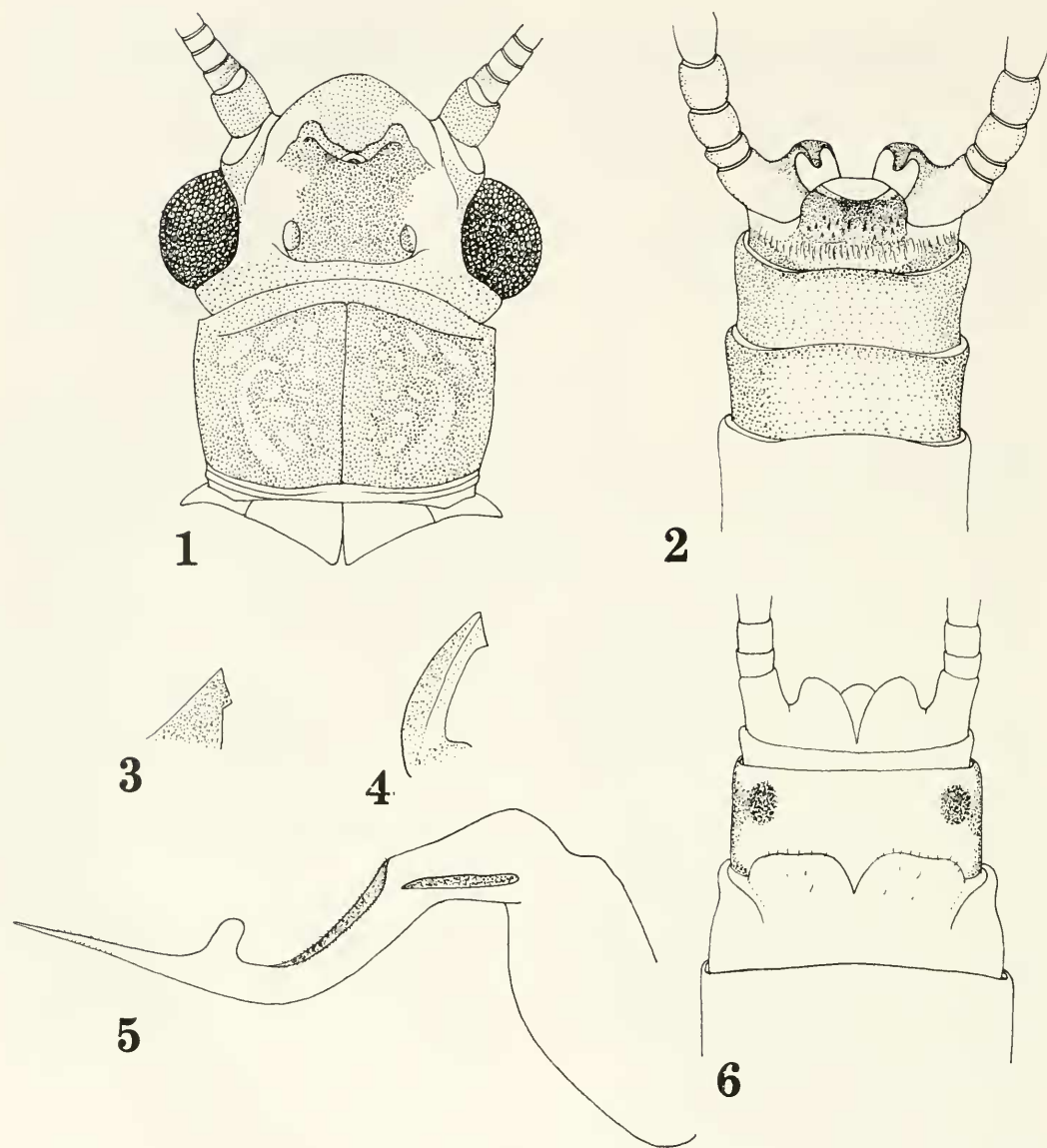
Only two species of stoneflies were listed for North Dakota by Stark et al. (1986), a state covering 18,299,503 hectares that includes two major river systems, the Missouri and the Red River of the North. The landscapes of North Dakota, as common with most Northern Great Plains states, exhibit relatively little topography, and the state is better known for its numerous prairie marshes (Van der Valk 1989). Many counties of the state have 80–90% of their total area in agricultural production.

The Red River forms the eastern border of the state with Minnesota, traversing the former bed of the glacial Lake Agassiz. The area west of the Red River Valley, a region often referred to as the Drift Prairie is poorly drained, with few streams of any gradient. West of the Drift Prairie is the Missouri Plateau, also an area of poor drainage, and further west is the Missouri River and its associated tributaries. These streams are often located in broad valleys of native grasses or hay and small grain production areas. The Little Missouri River is a prominent feature of western North Dakota and drains through the spectacular landscape known as

the “Badlands.” Streams of the Badlands are mostly silty and relatively unproductive (Gordon and Post 1965). A southern extension of the Northern Coniferous Forest can be found in the northwestern portion of the state.

Despite the presence of suitable lotic habitats throughout the state, only nine species of stoneflies have been recorded from North Dakota. Stark et al. (1986) in their compilation of North American stonefly records, listed only *Strophopteryx fasciata* (Burmeister) and *Haploperla orpha* (Frisson). However, we have found seven additional records in the literature. Harden and Mickel (1952) noted a record for *Isoperla longiseta* (Banks), and Neel (1985) in his ecological study of the Turtle River in eastern North Dakota discussed a species of *Acroneuria*, *Perlesta placida* (Hagen), and *Taeniopteryx nivalis* (Fitch). Finally, Stoaks (1975) listed nymphal records of *Pteronarcys dorsata* (Say), *P. placida*, *A. arenosa* (Pictet) and *I. bilineata* (Say) from the Forest River.

A recent collecting trip by the authors into southwestern North Dakota yielded an



Figs. 1-6. *Perlesta dakota*. 1, Adult head and pronotum. 2, Male terminalia, dorsal. 3, Paraproct, caudal. 4, Paraproct, lateral. 5, Penis. 6, Female subgenital plate, ventral.

undescribed species of *Perlesta*. The genus *Perlesta* in North America presently includes sixteen species (Stark 1989, Poulton and Stewart 1991, Stark and Rhodes 1997, Kirchner and Kondratieff 1997, DeWalt et al. 1998). The terminology in the description follows that proposed by Stark (1989).

***Perlesta dakota* Kondratieff and
Baumann, new species**
(Figs. 1-7).

Male.—Forewing length 8-9 mm. General color brown. Head yellow with dark brown pattern as Fig. 1. Pronotum dark brown (Fig. 1). Antennal scape and pedicel

brown, basal flagellar segments becoming darker brown beyond segments 10–16. Fore-femur dorsally brown. Wing membrane and veins brown except costal margin pale. Abdominal terga brown, sterna yellow brown usually with darker brown triangle-shaped shading. Cercus yellow brown. Tergum 10 mesal sclerite not divided, sensilla basiconica small and scattered (Fig. 2). Paraproct short in caudal view (Fig. 3), more slender in lateral view (Fig. 4), spine anteapical and directed mesad (Figs. 2 and 3). Penis tube + sac moderately long with raised shelf dorsobasally; caecum prominent, dorsal hair patch broad basally narrowing to base of caecum, lateral hair patch elongate (Fig. 5). Female. Forewing length 10–12 mm. Color pattern similar to male but paler. Subgenital plate truncate with notch deep and narrowly V-shaped (Fig. 6).

Egg.—Collar button-like. Chorion surface finely pitted with scattered coarser pitting. Micropylar row in posterior region (Fig. 7).

Nymph.—Unknown.

Types.—Holotype ♂, allotype ♀: North Dakota, Hettinger Co., Cannonball River, at New England, Hwy 22, 15 July 1997, R. W. Baumann and B. C. Kondratieff. Paratypes, same data as holotype: 14 ♂, 9 ♀; Ransom Co., Fort Ransom State Park, 11 July 1970, S. M. Anders, 1 ♂, 1 ♀ (NDSU); Stark Co., Heart River, Hwy 22, Dickinson, 14 July 1997, R. W. Baumann and B. C. Kondratieff, 2 ♀ (BYUC, CSUC). Holotype and allotype deposited in the National Museum of Natural History, Smithsonian Institution, other paratypes at the Monte L. Bean Life Sciences Museum, Brigham Young University (BYUC); C. P. Gillette Museum of Arthropod Diversity, Colorado State University (CSUC); North Dakota State University (NDSU) and the B. P. Stark Collection (BPSC).

Etymology.—The Sioux were the largest tribe of Native Americans of the North American Plains and prairies, and are called the Dakota in the Santee dialect.

Diagnosis.—*Perlesta dakota* appears



Fig. 7. *Perlesta dakota*, scanning electron photograph of egg.

similar to a group of dark species, including *P. cinctipes* (Banks), *P. adena* Stark, *P. fusca* Poulton and Stewart, and *P. xube* Stark and Rhodes. *Perlesta dakota* seems most similar to *P. fusca*, a species distributed throughout the Ozark-Ouachita Mountain region of Arkansas, Missouri and Oklahoma (Poulton and Stewart 1991). Males of *P. dakota* can be distinguished from *P. fusca* by the well developed thumb-like caecum (Fig. 5) and maculation of the head (Fig. 1). The penis structure of *P. dakota* is similar to *P. decipiens* (See Stark 1989; Figs. 42–43) but the former species can be distinguished by the dark brown wing and body coloration and head pattern. Females of *P. dakota* can be distinguished from *P. fusca* by the more truncate lobes of the subgenital plate and the deep and narrow notch (Fig. 6). The egg collar of *P. dakota* is button-like (Fig. 7), and the chorion finely pitted (Fig. 8). Poulton and Stewart (1991) indicated that the egg of *P. fusca* lacks a collar and the surface of the

egg is reticulate. The egg of *P. decipiens* has a distinctive short collar.

Remarks.—The type locality, the Cannonball River at New England, is typical of an agriculturally-impacted stream of the region, little or no riparian vegetation, heavily silted and with only few small riffles. Adults of *P. dakota* were collected by beating tall overhanging streamside grasses. Other aquatic insects collected with *P. dakota* include the damselfly *Calopteryx aquabilis* Say, the mayfly *Caenis* sp., and the caddisflies, *Cheumatopsyche pettiti* (Banks), *Ceratopsyche morosa* (Hagen), *Hydroptila consimilis* Morton, and *Limnephilius hyalinus* Hagen.

North Dakota Stonefly Records

Collections examined, primarily from North Dakota State University (NDSU), yielded new records or added to or substantiated previous records of North Dakota stoneflies. Other institutions listed include Brigham Young University (BYUC), Colorado State University (CSUC); Dickinson State University (DSUC); Minot State University (MSUM); Mississippi College (BPSC); Museum of Comparative Zoology, Harvard University (MCZC), University of Minnesota (UMSP), and University of Mississippi (UMIC). Some of these records are only identified to the generic level, but are included for distributional purposes, since so few stonefly records are currently available for North Dakota. A total of fifteen stonefly taxa are known from the state of North Dakota, representing at least eleven species.

Allocapnia sp.

Records.—Ransom Co., cold spring-fed stream, joining Sheyenne River, Hwy 46, Little Yellowstone Park, 1 Nov 1962, R. D. Gordon, 6 N (NDSU).

Several species of this genus of winter stoneflies could occur in North Dakota, especially *A. pygmaea* (Burmeister) (Ross and Ricker 1971).

Oemopteryx fosketti (Ricker)

Records.—Billings Co., Little Missouri River, Medora, 19 March 1997, C. P. Milne, 16 ♂, 6 ♀ (BYUC, CSUC, DSUC); Little Missouri River, Sully Creek Campground, 19 March 1997, C. P. Milne, 11 ♂, 1 ♀ (BYUC).

The species originally described from Saskatchewan, Canada, can be abundant in large and often silty rivers of the Missouri, Colorado, and Saskatchewan drainages (Baumann et al. 1977). Records for this species are known from nearby Dawson Co., Montana. The males have peculiar up-turned forewing tips.

Strophopteryx fasciata (Burmeister)

Records.—Cass Co., Fargo, 24 April 1900, E. Cleveland, 1 ♂ (MCZC).

Strophopteryx fasciata is a widespread species occurring throughout eastern and midwestern North America, and typically a larger stream species emerging in late winter and early spring (Stewart and Stark 1988).

The record for *T. nivalis* by Stoaks (1975) could not be confirmed due to the lack of material, but is possible, since this species is common in Minnesota (Ricker and Ross 1968).

Pteronarcys pictetii Hagen

Records.—North Dakota: Cavalier Co., 20 Oct 1962, 2 N (NDSU); Pembina Co., Pembina River, Walhalla City Park, 1 July 1970, Perkins and R. L. Post, 1 ♀ (NDSU); Pembina River, Walhalla, 9 July 1961, R. L. Post and H. Osborn, 4 N (NDSU); same but 20 Oct 1962, E. Saugstad, 2 N (NDSU); Richland Co., Sheyenne River, 14 mi NW Walcott, 24 June 1963, D. Aarhus, 1 ♀ (NDSU).

Pteronarcys pictetii has been reported from adjacent Minnesota and Manitoba (Stark et al. 1986), and was expected in the state. The separation of the nymphs of *P. dorsata* (Say) and *P. pictetii* is difficult, especially immature specimens. The transcon-

tinental species, *P. dorsata* has been reported from all surrounding states and Canadian provinces except South Dakota (Stark et al. 1986).

Pteronarcys sp.

Records.—Cass Co., Stearn, 25 Aug 1960, 1 N (NDSU); Cavalier Co., 20 Oct 1962, 1 N (NDSU); Grand Forks Co., Turtle River State Park, 8 Aug 1962, R. D. Gordon, 2 N (NDSU); Forest River, Hwy 18, 3 mi NE Inkster, 1 July 1970, R. Stoaks, 1 N (NDSU); same but 25 Aug 1970, 1 N (NDSU); same but 19 June 1971, 1 N (NDSU); same but 28 Aug 1971, 3 N (NDSU); same but 15 Sept 1991, 3 N (NDSU); Ward Co., Mouse River, Nedrose #1, SE Minot, 13 July 1957, R. Nelson, 1 ♀ (MSUM).

The nymphs collected by Ralph D. Stoaks are apparently the specimens listed by him as *P. dorsata*, a species that remains unconfirmed for the state. The adult female listed above could not be determined to species.

Acroneuria abnormis (Newman)

Records.—Richland Co., Mirror Pool, Sheyenne River, 23 June 1975, P. K. Lago, 1 ♂ (UMIC).

This widespread species was expected in North Dakota, and is known from all surrounding states and Canadian provinces (Stark et al. 1986, Huntsman et al. 1999).

Acroneuria lycorias (Newman)

Records.—Cass Co., Sheyenne River, 5 mi E Kindred, 28 June 1996, K. Mundal, 2 ♂, 3 ♀ (NDSU), same but 30 June 1996, K. Mundal, 2 ♂, 3 ♀ (NDSU); Grand Forks Co., Forest River, Hwy 18, 3 mi NE Inkster, 16 Oct 1971, R. Stoaks, 1 N (NDSU); Pembina Co., Pembina River, Walhalla, 9 Sept 1961, R. L. Post and H. Osborn, 14 N (NDSU); same but 20 Oct 1962, E. Saugstad, 2 N (NDSU); same but 20 Oct 1996, D. G. Aarhus, 1 N (NDSU).

This widespread eastern and upper mid-western Nearctic species has been recorded

from adjacent Minnesota and Manitoba. Harden and Mickel (1952) indicated that this species is one of the few stoneflies that occur in the western prairie regions of Minnesota.

Acroneuria sp.

Records.—Pembina Co., Pembina River, Walhalla, 9 Aug 1961, H. Osborn, 1 N (NDSU); Walsh Co., Forest River, USGS Gage, 3 mi SE Fordville, 15 Sept 1971, R. D. Stoaks, 1 N (NDSU).

Other possible species of *Acroneuria* reported from adjacent states and Canadian provinces include *A. carolinensis* (Banks) and *A. internata* (Walker) (Stark et al. 1986). Stoaks (1975) listed *A. arenosa*, however, this nymphal determination is doubtful since this species is restricted to the eastern U.S. (Stark and Gaufin 1976).

Perlesta decipiens (Walsh)

Records.—Cass Co., Sheyenne River, 5 mi E Kindred, 28 June 1996, K. Mundal, 3 ♀ (NDSU); NDAC, Fargo, USDA UV light trap, 6 July 1956, 1 ♀ (NDSU); Richland Co., 13 July 1962, 1 ♂, 4 ♀ (NDSU); Trail Co., Elm River, 8 Aug 1969, R. L. Post, 1 ♂ (NDSU).

The occurrence of this geographically widespread species was expected in the state.

Perlesta xube Stark and Rhodes

Records.—Walsh Co., Forest River, Hwy 35, 8 July 1966, R. L. Post, 2 ♂, 2 ♀, 3 N (NDSU).

Perlesta xube was recently described from a small stream in Cherry County, Nebraska (Stark and Rhodes 1997). This record from the Forest River represents a northeastern range extension, indicating that this species may occur in remnant stream systems throughout the northern Great Plains.

Perlesta sp.

Records.—Cass Co., Fargo, 13 July 1973, P. K. Lago, 1 ♀ (UMIC); Dunn Co.,

Knife River, Manning, 29 May 1991, Mott, 1 N (DSUC); Grand Forks Co., Turtle River, 23 June 1970, D. M. Huntsinger, 1 N (NDSU); Forest River, Hwy 18, 3 mi NE Inkster, 23 June 1970, R. D. Stoaks, 4 N (NDSU); Slope Co., Burning Coal Vein, 0.25 mi W Logging Camp Ranch, Little Missouri National Grassland, 6 July 1968, R. D. Stoaks, 6 N (NDSU); Walsh Co., Forest River, 3.5 mi W Fordville, Hwy 32, 19 June 1971, R. D. Stoaks, 31 N (NDSU); same but 11 July 1971, R. D. Stoaks, 4 N (NDSU); same but at USGS gage, 19 May 1971, R. D. Stoaks, 1 N (NDSU).

Nymphs of *Perlesta* are difficult to specifically distinguish, and much of the above material is poorly preserved or represents early instars. Stoaks (1975) and Neel (1985) reported *P. placida* as nymphs and as nymphs and adults, respectively. Stark (1989) determined that *P. placida* was a complex of at least twelve (now sixteen) species. No adults from Neel (1985) were available for study. With no associated males, the single female adult from Fargo was left undetermined.

Isoperla bilineata (Say)

Records.—Cass Co., Fargo, NDSU Campus, 7 June 1963, R. W. Poole, 7 ♂, 1 ♀ (NDSU); same but 16 June 1963, R. W. Poole, 7 ♂, 1 ♀ (NDSU) same but 18 June 1993, 6 ♂ (NDSU); Sheyenne River, 5 mi E Kindred, 30 June 1996, K. Mundal, 1 ♂, 4 ♀ (NDSU); NDAC, Fargo, USDA UV light trap, 9 June 1956, 20 ♂, 3 ♀ (NDSU). Emmons Co., 16 mi W Linton, 20 June 1975, P. K. Lago, 2 ♂ (UMIC); Grant Co., Heart Butte Dam, 19 June 1975, P. K. and B. A. Lago, 2 ♂ (UMIC); Pembina Co., Tongue River, Kotchman Farm, near Cavalier, 29 June 1974, P. K. and B. A. Lago, 3 ♂ (UMIC); same but 2 July 1975, 2 ♂ (UMIC).

Stoaks (1975) previously reported this species, but no specimens from his study were available for examination. Szczytko and Stewart (1978) indicated material from

the Red River of the North, Minnesota, which forms the border with North Dakota.

Isoperla longiseta (Banks)

Records.—Billings Co., Little Missouri River, Elkhorn Ranch, 20 June 1965, R. L. Post, 1 ♀ (NDSU); Cass Co., Fargo, 11 May 1939, D. G. Denning, 1 ♀ (UMSP); Slope Co., Little Missouri River, at Mar-marh, Hwy 12, 14 July 1997, R. W. Baumann and B. C. Kondratieff, 6 ♂, 7 ♀ (BYUC, CSUC).

Isoperla longiseta is known from western and midwestern North America, and occurs further east than any other typically western *Isoperla* (Szczytko and Stewart 1979). It is often considered a typical prairie stonefly of larger streams and rivers (Harden and Mickel 1952, Ricker 1946, 1964). Harden and Mickel (1952) previously mentioned the 1939 record of *I. longiseta* from Fargo.

Haploperla orpha (Frison)

Records.—Pembina Co., Tongue River, Kotchman Farm near Cavalier, 21 June 1974, P. K. and B. A. Lago, 2 ♂, 3 ♀ (BPSC); same but 23 July 1975, 1 ♂, 3 ♀ (UMIC).

Haploperla orpha is a relatively poorly known species having also been recorded from Maine, Minnesota, Quebec, New Brunswick, and Wisconsin (Stark et al. 1986). Typically, nymphs of this species are found in medium and small-sized streams with some gradient.

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LITERATURE CITED

- Baumann, R. W., A. R. Gaufin, and R. F. Surdick. 1977. The stoneflies (Plecoptera) of the Rocky Mountains. *Memoirs of the American Entomological Society* 31, 208 pp.
- DeWalt, R. E., B. P. Stark, and M. A. Harris. 1998. *Perlesta golconda* (Plecoptera: Perlidae), a new stonefly species from Illinois. *Entomological News* 109: 315–317.
- Gordon, R. D. and R. L. Post. 1965. North Dakota water beetles. North Dakota Insects, Publication 5, Agricultural Experiment Station, North Dakota State University 53 pp.
- Harden, P. H. and C. E. Mickel. 1952. The stoneflies of Minnesota (Plecoptera). University of Minnesota Agricultural Experiment Station, Technical Bulletin 201, 82 pp.
- Huntsman, B. O., R. W. Baumann, and B. C. Kondratieff. 1999. The stoneflies (Plecoptera) of the Black Hills of South Dakota and Wyoming, USA: Distribution and zoogeographic affinities. *Great Basin Naturalist* 59: 1–17.
- Kirchner, R. F. and B. C. Kondratieff. 1997. A new species of Nearctic *Perlesta* (Plecoptera: Perlidae) from Virginia. *Proceedings of the Entomological Society of Washington* 99: 290–293.
- Neel, J. K., Sr. 1985. A northern prairie stream. University of North Dakota Press, Grand Forks. 274 pp.
- Poulton, B. C. and K. W. Stewart. 1991. The stoneflies of the Ozark and Ouachita Mountains (Plecoptera). *Memoirs of the American Entomological Society* 38, 116 pp.
- Ricker, W. E. 1946. Some prairie stoneflies (Plecoptera). *Transactions of the Royal Canadian Institute* 26: 3–8.
- . 1964. Distribution of Canadian stoneflies, pp. 50–71. In Illies, J. ed., 3. Internationales Symposium über Plecopteren. August. Gewässer und Abwasser, Bagel, Dusseldorf, 138 pp.
- Ricker, W. E. and H. H. Ross. 1968. North American species of *Taeniopteryx* (Plecoptera: Insecta). *Journal of the Fisheries Research Board of Canada* 25: 1423–1439.
- Ross, H. H. and W. E. Ricker. 1971. The classification, evolution, and dispersal of the winter stonefly genus *Allocapnia*. *Illinois Biological Monograph* 45, 166 pp.
- Stark, B. P. 1989. *Perlesta placida* (Hagen), an eastern Nearctic species complex (Plecoptera: Perlidae). *Entomologica Scandinavica* 20: 263–286.
- Stark, B. P. and A. R. Gaufin. 1976. The Nearctic species of *Acroneurta* (Plecoptera: Perlidae). *Journal of the Kansas Entomological Society* 49: 221–253.
- Stark, B. P. and H. A. Rhodes. 1997. *Perlesta xube*, a new stonefly species from Nebraska (Plecoptera: Perlidae). *Entomological News* 108: 92–96.
- Stark, B. P., S. W. Szczytko, and R. W. Baumann. 1986. North American stoneflies (Plecoptera): systematics, distribution, and taxonomic references. *Great Basin Naturalist* 46: 383–397.
- Stewart, K. W. and B. P. Stark. 1988. Nymphs of North American stonefly genera (Plecoptera). Thomas Say Foundation, Entomological Society of America, 12, 460 pp.
- Stoaks, R. D. 1975. Seasonal and spatial distribution of riffle dwelling aquatic insects in the Forest River, North Dakota. Ph.D. dissertation, North Dakota State University, Fargo, 163 pp.
- Szczytko, S. W. and K. W. Stewart. 1978. *Isoperla bilineata*: designation of a neotype and allotype, and further descriptions of egg and nymph. *Annals of the Entomological Society of America* 71: 212–217.
- . 1979. The genus *Isoperla* (Plecoptera) of western North America; holomorphology and systematics, and a new stonefly genus *Cascadopera*. *Memoirs of the American Entomological Society*, 32: 120 pp.
- Van der Valk, A. 1989. Northern Prairie Wetlands. Iowa State University Press, Ames. 400 pp.